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Studies in the Coleoptera of Western Sand Dunes

I. Five New *Polyphylla* Harris

(Scarabaeidae)

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Recent investigations of sand dunes in the Western United States have uncovered many species of Coleoptera which are restricted to one or a few dune systems (see Hardy 1971, 1973, 1974, 1976, 1977; Hardy and Andrews 1974; Howden and Hardy 1971; Gordon 1974; Gordon and Cartwright 1977). The reasons for this interesting degree of endemism or reduced distribution will be discussed in detail elsewhere. One of the most commonly encountered groups adapted to sand niches is the family Scarabaeidae, with many subfamilies represented. Below are described five species of *Polyphylla* taken in the course of research on sand dunes. One species previously described from this niche is *Polyphylla devistiva* Young.

***Polyphylla avittata* Hardy, new species** (Figs. 1, 2, 11)

Holotype male: Length 22 mm, width 7.5 mm. Integumentary color of head piceous; thorax rufous; elytra rufo-testaceous; ventral surfaces (except abdomen), legs rufo-testaceous; abdomen rufo-piceous. Clypeal margin reflexed, outer apical angles well defined; reflexed margins with dense, close white scales (Fig. 11); few scales medially on clypeal disc, along fronto-clypeal suture, scattered over front. Clypeus, front with close to contiguous large punctures, punctures with single scale or suberect hair. Vertex impunctate, glabrous, shining. Prothorax with close to contiguous punctures, with scales or hairs as above. Scales denser on midline and medio-laterally; prothorax appearing trivittate. Elytra lacking well defined punctures of thorax and head, but sparsely to densely covered with scattered scales, giving appearance of random clumping, without vittae, scales slightly smaller than on prothorax. Pygidium uniformly with scales and short recumbent hairs.

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Antennal club (measured in straight line, not along curve) twice length of three basal segments (Fig. 11). Apical segment of maxillary palp slightly less than length of two basal segments; flattened on dorsal surface. Anterior tibia bidentate. Ventral surface of thorax with long grayish hairs.

Variation in paratypes: Length 19.5-22 mm, width 7-7.5 mm. Most paratypes (9 of 12) have a faint indication of a third anterior tibial tooth, but this is never developed into more than just a slight flange on the tibial edge. Paratypes agree well in other respects.

Female: Unknown.

The name refers to the spotted, rather than vittate, elytra.

Holotype male, (CAS# 13098) and 12 male paratypes: Utah, Washington Co., 6 mi. S. Hurricane, Hurricane Dunes, VII-15-1975, Fred G. Andrews, Alan R. Hardy, collected at blacklight. (Deposited in USNM, CAS, Howden, CDA and Hardy.)

Diagnosis: *P. avittata* keys to either *hammondi* or the *diffracta* complex (couplet #4) in Fall's Key (1923:34), depending upon interpretation of the bidentate vs. tridentate condition of the anterior tibiae. When scaled dorsally, *P. hammondi* is unmistakably vittate, unlike the "blotched" elytral pattern of *avittata* (Figs. 1, 2). *P. avittata* is also smaller than *hammondi*. In the *diffracta* complex (see Young 1976), *avittata* keys to *diffracta*, but differs in the "blotched" versus vittate elytra (*diffracta* occasionally lack vittae, but are never "blotched"). The "blotched" elytra of *avittata* resemble the new world species *variolosa* or *nubila*, or several old world species, such as *fullo*, although not as densely scaled as the old world species. *P. avittata* differs from *nubila* by the lack of erect elytral hairs which are present in *nubila*. From *variolosa*, *avittata* may be easily distinguished by the dorsal squamae, which are thin and hair-like in *variolosa*, but broad and scale-like in *avittata*, and the sharp clypeal corners of *avittata* compared with the round clypeal corners of *variolosa*.

Remarks: This species was collected at blacklights placed upon the dunes. The area is also known as the "Warner Valley Dunes" by local residents, and is visible to the south from State Highway 17, to the east of the Virgin River. The dunes are evidently derived from Navajo Sandstone, and are the red color typical of the sand and rocks in that part of Utah. Vegetation on the dunes is primarily *Artemisia filiformis*, while surrounding vegetation is *Larrea divaricata* Cav.

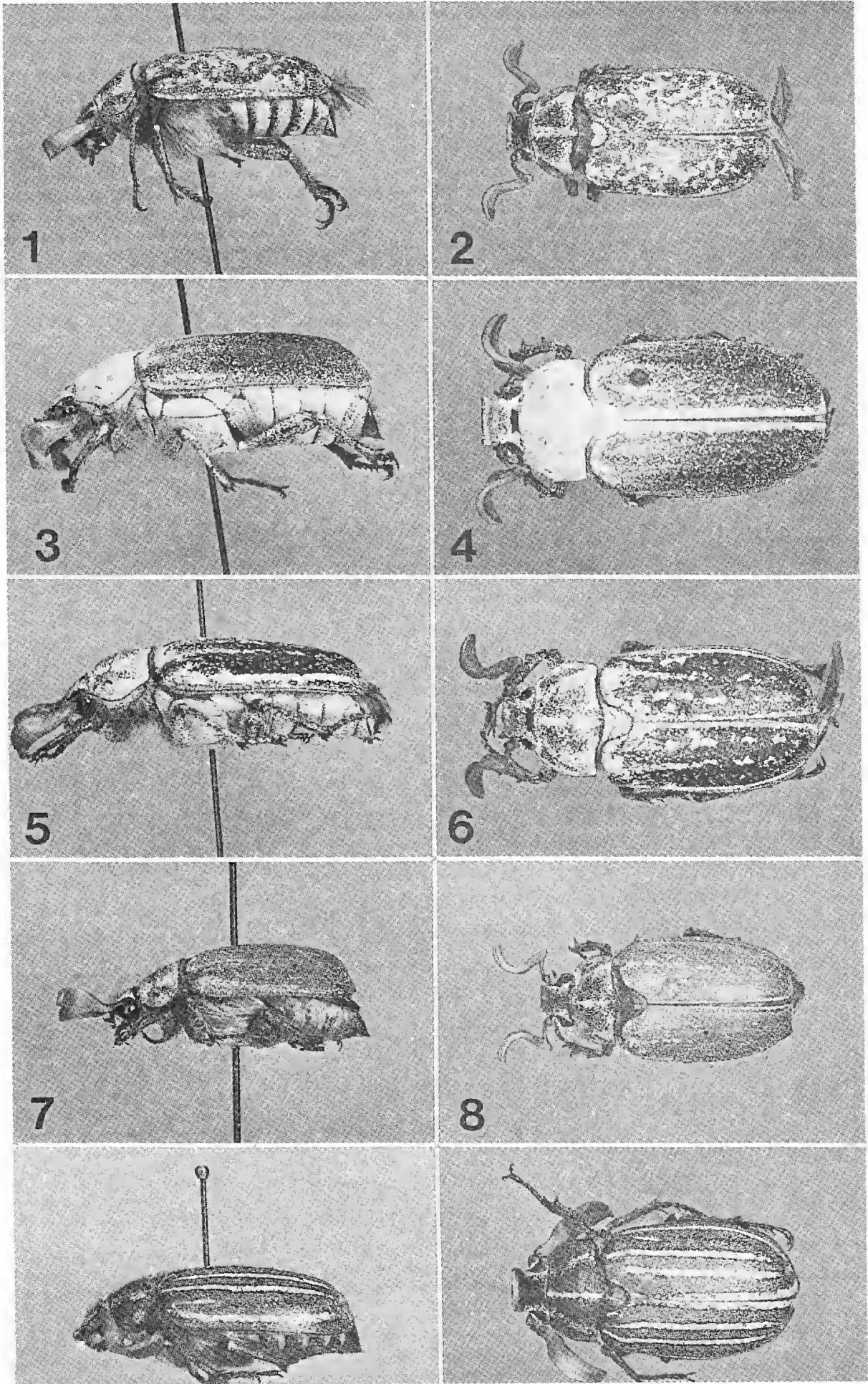
***Polyphylla anteronivea* Hardy, new species**

(Figs. 3, 4, 12)

Holotype male: Length 26 mm, width 8.8 mm. Integumentary color of head piceous to rufo-piceous; thorax rufo-piceous; elytra, ventral body surfaces, appendages testaceous. Clypeal angles well defined (Fig. 12); reflexed margin, disc, front with close to contiguous round to oval, cream to white scales. Front with few semierect cream colored bristle-like hairs. Vertex smooth, glabrous, thorax with close to contiguous to densely overlap-

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Figs. 1-10, *Polyphylla* new species. Figs. 1 and 2, *P. avittata*. Figs. 3 and 4, *P. anteronivea*. Figs. 5 and 6, *P. erratica*. Figs. 7 and 8, *P. pottorum*. Figs. 9 and 10, *P. monahansensis*. All to same scale.



ping oval white scales, which obscure virtually entire thoracic integument. Few scattered erect hairs at anterior margin of prothorax. Scutellum contiguously covered with oval white scales. Elytra anteriorly, along suture, lateral margin and apically, with scattered to contiguous oval white scales. Ventral thoracic segments with sparse, medium, gray to white erect hairs, less dense than in most *Polyphylla*. Apical segment of maxillary palp short (.7 times length of basal two segments), stout (length 3.2 times width), with small, slightly concave area dorsally. Antennal club 2 (linear measurement) or 2.8 (along curve) times length of basal segments. Anterior tibiae strongly tridentate (Fig. 12).

Variation in paratypes: Length 21-29 mm, width 7-10 mm. Except for specimens which have been abraded or greased, the only notable difference is in the elytral scalation, which may be reduced, or may not appear vittate.

Female: Unknown.

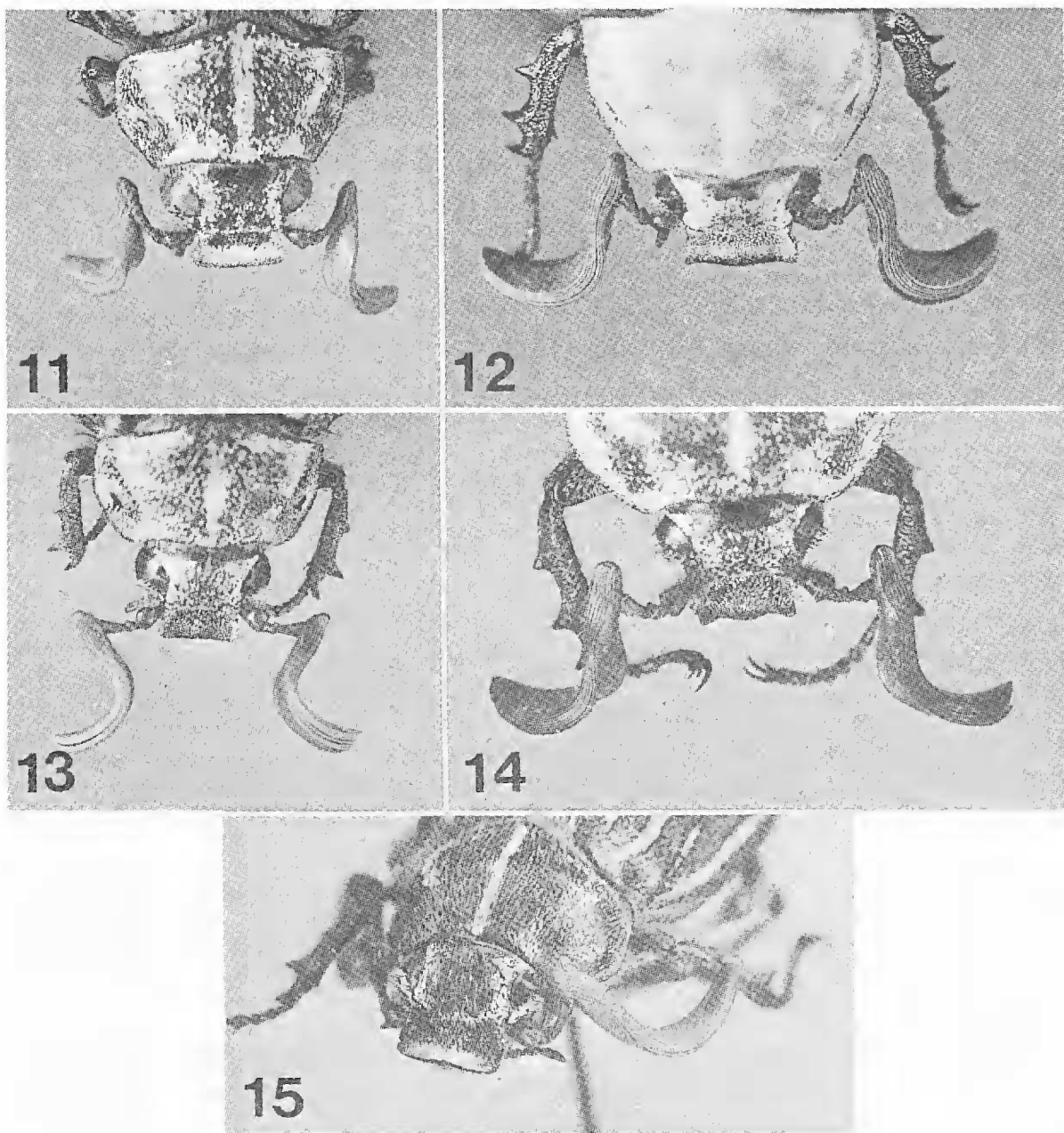
The name refers to the snow covered appearance of the anterior portion of the insect (Fig. 4).

Holotype male (CAS #13097) and two male paratypes: California, Inyo Co., Saline Valley Dunes, VI-13-1976 D. Giuliani coll. Thirty-three additional paratypes, all Saline Valley, as follows: Dunes Blacklight, #8, VII-8-1976 D. Giuliani (3); Dunes #11, D. Giuliani VIII-10-1976 (1); VI-1-1974 N. Rulien (1); Dunes, VI-10-1973, J. M. Cicero (21); Dunes, V-18-1973, J. M. Cicero (6); Lake, V-18-1973, J. M. Cicero (1). (Deposited in USNM, CAS, CDA, Cicero, Howden, Nelson, Potts, Rulien.)

Diagnosis: *P. anteronivea*, by virtue of the strongly tridentate anterior tibiae (Fig. 4), would key to couplet two in Fall's 1928 key, which includes the species *cavifrons* and *hammondi*. *P. squamiventris* Cazier would also run to that portion of the key. *P. cavifrons* has the antennal club less than twice as long as the basal segments, hair-like dorsal scales, less acute clypeal angles, and a more densely pubescent ventral thoracic area than *anteronivea*. *P. hammondi* has a vittate thorax, the anterior angles of the clypeus are narrower than the lateral margins (clypeus of *anteronivea* is widest at angles), and the front and clypeus are more pubescent than in *anteronivea*. (It should be noted that although both of the keys by Casey and Fall use the tridentate anterior tibiae of *hammondi* as significant, in series, Arizona specimens range from strongly tridentate to weakly tridentate to bidentate. There is, additionally, an undescribed species near *hammondi* from central Mexico with strongly tridentate anterior tibiae.) *P. squamiventris* has an antennal club less than 1.5 times the length of the basal segments, a pronounced pronotal vittae, and unimpressed maxillary palp, which distinguishes this species from *anteronivea*. *P. anteronivea* is easily recognized at first glance by the unique vestiture (Figs. 3, 4). *P. anteronivea* is related to the following species.

***Polyphylla erratica* Hardy, new species** (Figs. 5, 6, 14)

Holotype male: Length 26.5 mm, width 9.7 mm. Integument of head rufous, except piceous vertex, anterior, lateral clypeal margins and angles. Thoracic integument rufous. Elytra, ventral surfaces, pygidium, appendages rufo-testaceous; antennal club testaceous. Clypeus quadrate, margins strongly reflexed, anteriorly bisinuate, outer angles sharp, nearly spinose (Fig. 14). Clypeal disc with close to contiguous oval white scales;



Figs. 11-15, *Polyphylla*, new species. Fig. 11, *P. avittata*. Fig. 12, *P. anteronivea*. Fig. 13, *P. pottsorum*. Fig. 14, *P. erratica*. Fig. 15, *P. monahansensis*. Fig. 11-14 to same scale.

front with close to contiguous to "shingled" oval white scales, with semierect to erect testaceous hairs; vertex shining, impunctate, glabrous. Prothorax with close, to "shingled" oval white scales, slightly denser medially, medio-laterally, forming trivittate prothoracic pattern normal for genus; few erect to semierect white to testaceous hairs at anterior margin. Scutellum "shingled" with oval white scales. Elytra with oval white scales, which are dense and "shingled" anteriorly; becoming scattered laterally, posteriorly; forming broken "vittae". Elytra lacking hairs. Pygidium with close white oval scales. Ventral surfaces nearly completely covered (except sutures) with oval white scales. Thorax ventrally with erect white hairs. Antennal club 2 (linear) to 3.3 (along curve) times length basal segments. Anterior tibiae strongly tridentate.

Variation in paratypes: Length 23-27 mm, width 8-9.5 mm. Most pronounced difference is in the squamal vestiture, which may be nearly absent (abrasion?) to the semivittate condition described above (Fig. 6).

Female: Unknown.

The name refers to the erratic elytral pattern.

Holotype male, (CAS #13099) and three male paratypes: California, San Bernardino Co. [Death Valley National Monument], Saratoga Springs IV-1974, Dusk, D. Giuliani collr. 62

additional paratypes as follows: California, Death Valley, Inyo Co. [sic.], Saratoga Springs VI-12-1964, Fred G. Andrews (3); California, Death Valley, V-27/29-1955 Belkin et al., (57); California, Inyo Co., Tecopa VI-17-54, Belkin and McD. (1); California, Inyo Co., Tecopa VII-11-1953 (1). (Paratypes in USNM, LACM, CAS, Howden, Hardy.)

Diagnosis: *Polyphylla erratica*, because of the tridentate anterior tibia, would key to couplet two in Fall's key. Species which also have this tridentate characteristic are *P. hammondi*, *cavifrons*, *squamiventris*, and *anteronivea*. *P. hammondi* has shorter antennal club (1.5 to 2 times length of basal segments, *erratica* usually greater than 2 times [Fig. 14]), less pronounced clypeal angles, both white and yellow prothoracic scales (*erratica* has white only), testaceous (as opposed to white) ventral hairs, and usually at least some hairs on clypeus and thoracic disc behind anterior margin (*erratica* has hairs confined to front and anterior prothoracic margin). *P. cavifrons* lacks the clypeal angles, has an anteriorly expanded clypeal shape (quadrate in *erratica*) a smaller antennal club (less than twice length of basal segments) and fine hair-like scales (oval in *erratica*). *P. squamiventris* has a short antennal club (shorter than *cavifrons*), and an unimpressed maxillary palp (small concave area in *erratica*). *P. erratica* is evidently most closely related to the preceding species. *P. anteronivea* has slightly less well developed clypeal angles, an apically broadened clypeus (quadrate in *erratica*), less elongate and apically less pointed scales, and an anterior elytral impression which results in a transverse carina from the scutellum towards the humeral area. Additionally, *anteronivea* lacks any trace of a pattern or vittae in the posterior half of the elytra (*erratica* usually displays at least some evidence of fragmented vittae posteriorly).

Remarks: Some specimens from Saratoga Springs were taken at dusk flying low over *Distichlis* grass in the salt encrusted bottom of the Amargosa River. These specimens were not attracted to black-light after dark.

***Polyphylla pottsorum* Hardy, new species**

(Figs. 7, 8, 13)

Holotype male: Length 20 mm, width 7 mm. Integument of head, prothorax, scutellum piceous; elytra, antennal club, ventral body surfaces pale testaceous; pygidium, basal segments of antennae, legs testaceous. Clypeus widened apically, anterior margin reflexed, nearly linear, angles sharp, not produced above anterior margin (Fig. 13). Clypeus, front with elongate, pointed white scales, intermixed with semierect gray hairs. Prothoracic disc with few erect hairs close to anterior margin; with elongate white scales closely to densely over surface; scales intermixed with recumbent white scale-like hairs medially; Prothorax appearing faintly trivittate (Fig. 8). Elytra sparsely covered with small, elongate, pointed white scales, faintly vittate at elytral base. Pygidium sparsely scaled. Antennal club approximately 2 (linear) to 2.5 times (along curve) length of basal segments (Fig. 13). Ventral abdominal segments glabrous basally near suture, densely scaled apically; covered with sparse to dense, long, fine pubescence. Ventral surface of thorax den-

sely covered with long, white hairs, except glabrous patch at midline of metasternum. Anterior tibia distinctly tridentate, not as strongly as previous species (Fig. 13).

Variation in paratypes: Length 16-22 mm, width 5.5-7.6 mm. There is some variation in the development of the third (basal) tibial tooth, but in all cases, there is clearly a third tooth present. Variation in scale density varies the elytral appearance from that of glabrous (although scales are present) to distinctly vittate, with vittae extending nearly to elytral apex.

Female: Unknown.

The name is in recognition of the contributions of Mr. and Mrs. R. W. L. Potts, who first drew my attention to this species.

Holotype male (CAS #13101) and 145 male paratypes: Texas, Ward Co., Monahans Sandhills State Park, VI-6/7-1977, Potts and Potts collrs.; 184 additional male paratypes, same locale, as follows: V-28-1975, Potts and Potts (29); VII-1977, R. Lenczy (8); VII-15/16-1975, dead at light, G. H. Nelson (36); VII-23/24-1976, ultraviolet light, G. H. Nelson (III). (Deposited in CAS, USNM, Lenczy, Nelson, Potts, Hardy.)

Diagnosis: *P. pottsorum* is another of the species with tridentate anterior tibiae (*hammondi*, *cavifrons*, *squamiventris*, *anteronivea* and *erratica*, above). From all of these species except *squamiventris*, *pottsorum* may be readily separated by the small size (all other species greater than 22 mm in length). *P. pottsorum* may be distinguished from the closely related *squamiventris*, by the longer antennae (1.5 times basal segments, in *squamiventris* vs. 2 times, or more, in *pottsorum*), presence of clypeal setae, lighter elytral color, impressed maxillary palp, longer, thinner squamae on prothorax, and testaceous legs.

***Polyphylla monahansensis* Hardy, new species** (Figs. 9, 10, 15)

Holotype male: Length 26 mm, width 8.5 mm. integumentary color testaceous to ruto-testaceous except for piceous vertex, ocular canthi, clypeal suture, lateral clypeal margins. Apical clypeal margin reflexed; laterally, medially angulate. Reflexed clypeal margin, lateral margins, ocular canthi, lateral portions of front, vertex with close, recumbent elongate white scales. Medial portions of clypeus, front with few scattered white scales intermixed with long, erect testaceous hairs. Thorax trivittate basally; coarsely punctured, each puncture with a recumbent scale or single long erect testaceous hair. Punctures finer, closer anteriorly at midline. Elytra noticeably vittate (Fig. 10), with scales smaller than thoracic scales. Pygidium without scales, with numerous short, semirecumbent testaceous hairs. Apical pygidial margin reflexed. Antennal club nearly 3 times length of basal segments (straight line measure). Maxillary palp cylindrical in cross section, without flattened area. Anterior tibia bidentate. Thorax ventrally with dense, erect testaceous hairs. Ventral abdominal segments with sparse, recumbent, small white scales.

Variation in paratypes: Length 21-27.5 mm, width 7.5-9.5 mm. Most conspicuous variation from the description above is in the shape of the reflexed anterior clypeal margin, which may lack the medial clypeal angulation, and have the lateral angles more rounded; and the anterior tibial teeth, which may be bidentate (as above) to strongly tridentate. The thoracic vittae may be more clearly developed than the type, and the elytral vittae occasionally may be faint, but are, in all specimens examined, clearly discernable throughout their length.

Female: Unknown.

The name refers to the type locality, Monahans, Texas.

Holotype male (CAS #13100) and 39 male paratypes: Texas, Ward Co; Monahans Sandhills State Park, VI-6/7-1977, Potts and Potts. 98 additional paratypes, same

locale; except, VII-1977, R. Lenczy (8); VII-28-75, Potts and Potts (23); VII-15/16-75, G. H. Nelson (5); VII-23/24-1976, G. H. Nelson (62). (Deposited in CAS, USNM, Howden, Nelson, Lenczy, Potts, Hardy.)

Diagnosis: *P. monahansensis* keys to *hammondi* or *diffracta*, depending upon the dentition of the anterior tibiae (bidentate or tridentate). From *hammondi*, *monahansensis* may be distinguished by the longer antennal club (length 2.75 times or less length of basal segments in *hammondi*, 2.75 times or greater [usually \pm three times] in *monahansensis*), position of the teeth on the anterior tibiae (all more apical in *monahansensis*); and suberect to erect long hair over disc of prothorax. From *diffracta*, *monahansensis* is distinguished by the long antennal club (2 times or less in *diffracta*), evenly cylindrical maxillary palp (flattened dorsally in *diffracta*) and apically more expanded clypeus.

Polyphylla speciosa Casey

Polyphylla rufescens Tanner 1928:276, NEW SYNONYMY

We have recently seen a series of specimens taken at Zion National Park, which display in every respect the characters described by Tanner for his unique male. The "edentate" condition is believed to be derived from wear, as is the case in some individuals in the series above.

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